

## CLAIMS

1. An electrolyte for a secondary battery comprising an aprotic solvent;

imide anion and transition metal ion, contained in the aprotic solvent, which can form a metal complex on an anode at least through a charge-discharge process; and

a compound containing a sulfonyl group in the aprotic solvent.

2. An electrolyte for a secondary battery comprising an aprotic solvent containing a lithium salt as an electrolyte salt; and

a metal complex made up of imide anion and transition metal ion, and a compound having a sulfonyl group contained in the aprotic solvent.

3. The electrolyte for the secondary battery as defined in claim 1 or 2, wherein the compound having the sulfonyl group is at least one compound selected from the group consisting of 1,3-propanesultone, 1,4-butanedisultone, sulforane, alkane sulfonic acid anhydride, a  $\gamma$ -sultone compound and a sulfolene compound.

4. The electrolyte for the secondary battery as defined in any

one of claims 1 to 3, wherein the electrolyte contains at least one of vinylene carbonate and its derivative.

5. The electrolyte for the secondary battery as defined in any one of claims 1 to 4, wherein the transition metal is a lanthanoid metal.

6. The electrolyte for the secondary battery as defined in claim 5, wherein the lanthanoid metal is selected from a group consisting of europium, neodymium, erbium and holmium.

7. The electrolyte for the secondary battery as defined in any one of claims 1 to 6, wherein the imide anion is  $-\text{N}(\text{C}_n\text{F}_{2n+1}\text{SO}_2)(\text{C}_m\text{F}_{2m+1}\text{SO}_2)$  ("n" and "m" are natural numbers).

8. The electrolyte for the secondary battery as defined in any one of claims 1 to 7, wherein the imide anion or its metal complex is contained in the electrolyte in a range from 0.005 to 10% in weight.

9. The electrolyte for the secondary battery as defined in any one of claims 1 to 8, wherein the compound having the sulfonyl group is contained in the electrolyte in a range from 0.01 to 10% in weight.

10. The electrolyte for the secondary battery as defined in any one of claims 1 to 9, wherein the aprotic organic solvent is at least one organic solvent selected from the group consisting of cyclic carbonates, linear carbonates, aliphatic carboxylate esters,  $\gamma$ -lactones, cyclic ethers, linear ethers and their fluorinated derivatives.

11. The electrolyte for the secondary battery as defined in any one of claims 1 to 10, wherein the lithium salt is at least one lithium salt selected from the group consisting of  $\text{LiPF}_6$ ,  $\text{LiBF}_4$ ,  $\text{LiAsF}_6$ ,  $\text{LiSbF}_6$ ,  $\text{LiClO}_4$ ,  $\text{LiAlCl}_4$ ,  $\text{LiN}(\text{C}_n\text{F}_{2n+1}\text{SO}_2)(\text{C}_m\text{F}_{2m+1}\text{SO}_2)$  (“n” and “m” are natural numbers).

12. A secondary battery comprising a cathode and an anode characterized in that the electrolyte for the secondary battery defined in any one of claims 1 to 11 is used.

13. The secondary battery as defined in claim 12, wherein the cathode is a lithium-containing composite oxide which can occlude and release lithium.

14. The secondary battery as defined in claim 12, wherein the anode is made of a material selected from one component selected from the group consisting of a material which can occlude and release lithium; lithium metal; a metal material

- 5    which can form alloy with the lithium and an oxide material or is made of a mixture composed of two or more of the materials.

15.     The secondary battery as defined in claim 14, wherein the material which can occlude and release lithium contains carbon.

16.     The secondary battery as defined in claim 15, wherein the carbon is graphite.

17.     The secondary battery as defined in claim 15, wherein the carbon is amorphous carbon.